Imperial Solar Energy Center South

Appendix E

Construction Acoustical Site Assessment

Prepared by Investigative Science and Engineering, Inc.

August 19, 2010

CONSTRUCTION ACOUSTICAL SITE ASSESSMENT
IMPERIAL SOLAR ENERGY CENTER SOUTH
IMPERIAL COUNTY, CA

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INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The subject project site consists of approximately 903 acres of privately owned, undeveloped agricultural land, in the unincorporated Mt. Signal area of the County of Imperial, approximately eight miles southwest of the City of El Centro (refer to Figure 1 on the following page). The property is located south of Anza Road, north of Cook Road, and is generally bisected by Pullman Road. The project site consists of six parcels, namely, Assessor Parcel Numbers (APN): 052-190- 021; 052-190-022; 052-190-023; 052-190-033; 052-190-034; and, 052-190-037.

The United States international border with the Republic of Mexico is located immediately south of the project site. Federal lands under jurisdiction of the Bureau of Land Management (BLM) are located immediately west of the project site. The property is designated by the County of Imperial General Plan as "Agriculture" and is zoned A-3 – Heavy Agriculture and A-2-R-General Agricultural Rural Zone. The site is currently utilized for alfalfa production as shown in Figures 2a through –c starting on Page 3 of this report. Elevations across the site range from approximately 0 to 10 feet above mean sea level (MSL).

Project Description

The electricity generation process associated with the proposed project would utilize clean solar photovoltaic (PV) technology to convert sunlight directly into electricity. Under this technology, groups of photovoltaic modules are wired together to form a photovoltaic array. The PV arrays convert solar radiation into direct current (DC) electricity. The direct current from the array is collected at an inverter where the current is converted to phase and impedance adjusted alternating current (AC) for use within the electrical grid. The output from the inverter then flows through a step-up transformer before it reaches the transmission and distribution system. The proposed Imperial Solar Energy Center South site would have a nominal rated capacity of 200 megawatts (MW).

The major generation equipment comprising the photovoltaic electrical generation system includes PV solar modules; a panel racking and foundation design; inverter and transformer station; an electrical collection system; and a switchyard. The proposed design for the Imperial Solar Energy Center South site is shown in Figure 3 on Page 5 of this report.

Finally, the proposed photovoltaic facility site is located approximately five miles south of the existing Imperial Valley Substation. The photovoltaic facility would interconnect to the utility grid at the 230 kV side of the Imperial Valley Substation via an approximately five-mile long, 120-foot wide transmission line within lands maintained by the U.S. Bureau of Land Management.

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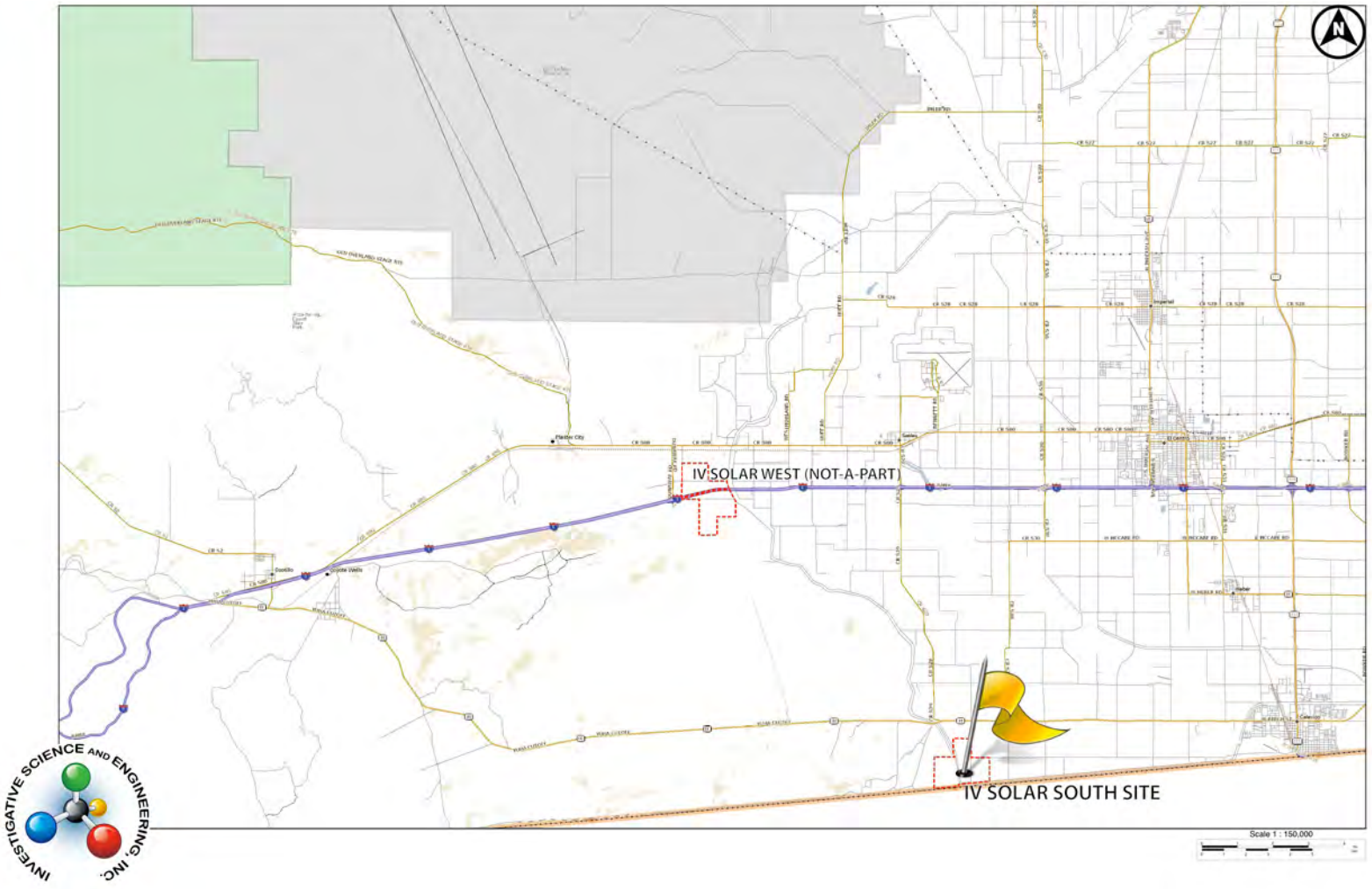

FIGURE 1: Project Area Vicinity Map (ISE 8/10)

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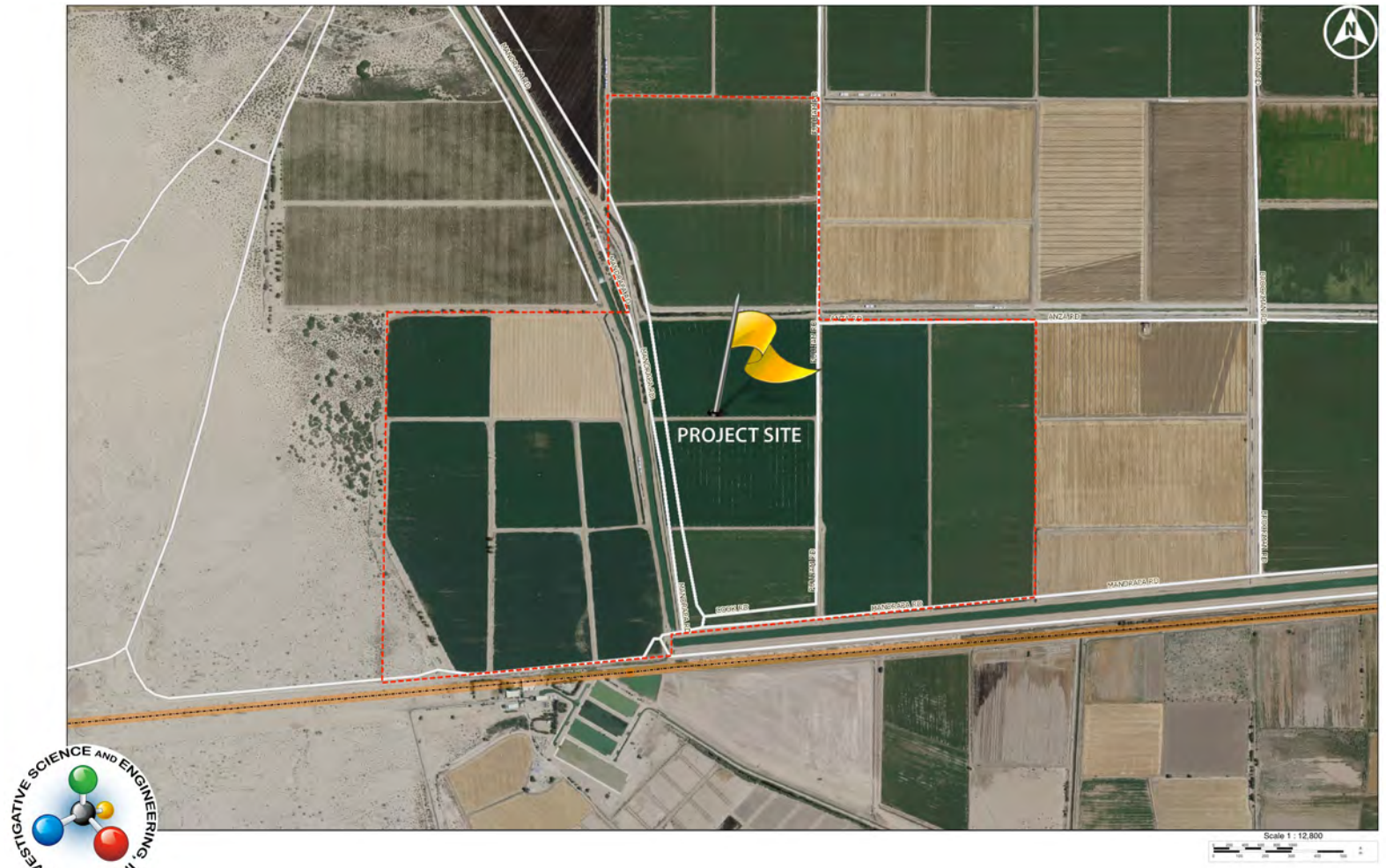

FIGURE 2a: Imperial Solar Energy Center South Site Map (ISE 8/10)

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FIGURE 2b: Project Site Panoramic Photograph – View Looking from Cook Road at ML 1 (ISE 7/10)

FIGURE 2c: Project Site Panoramic Photograph – View Looking from Pulliam Road at ML 2 (ISE 7/10)

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FIGURE 3: Conceptual Facility Site Plan (Zachry Engineering 2010)

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Acoustical Definitions and Theory

Sound waves are linear mechanical waves. They can be propagated in solids, liquids, and gases. The material transmitting such a wave oscillates in the direction of propagation of the wave itself. Sound waves originate from some sort of vibrating surface. Whether this surface is the vibrating string of a violin or a person's vocal cords, a vibrating column of air from an organ or clarinet, or a vibrating panel from a loudspeaker, drum, or aircraft, the sound waves generated are all similar. All of these vibrating elements alternatively compress the surrounding air on a forward movement, and expand it on a backward movement.

There is a large range of frequencies within which linear waves can be generated, sound waves being confined to the frequency range that can stimulate the auditory organs to the sensation of hearing. For humans this range is from about 20 Hertz (Hz or cycles per second) to about 20,000 Hz. The air transmits these frequency disturbances outward from the source of the wave.

Sound waves, if unimpeded, will spread out in all directions from a source. Upon entering the auditory organs, these waves produce the sensation of sound. Waveforms that are approximately periodic, or consist of a small number of periodic components, can give rise to a pleasant sensation (assuming the intensity is not too high), for example, as in a musical composition.

Noise, on the other hand, can be represented as a superposition of periodic waves with a large number of components, and is generally defined as unwanted or annoying sound that is typically associated with human activity, and which interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day, and the sensitivity of the individual hearing the sound.

Airborne sound is a rapid fluctuation of air pressure, above and below atmospheric levels. The loudest sounds that the human ear can hear comfortably are approximately one trillion (or $1x10^{12}$) times the acoustic energy that the ear can barely detect. Because of this vast range, any attempt to represent the acoustic intensity of a particular sound on a linear scale becomes unwieldy. As a result, a logarithmic ratio, originally conceived for radio work, known as the decibel (dB), is commonly employed.[1]

[1] A unit used to express the relative magnitude of a sound wave. This level is defined as being equal to 20 times the common logarithm of the ratio of the pressure produced by a sound wave of interest, to a 'reference' pressure wave equal to 20 micro Pascal's (μPa) measured at a distance of 1 meter. 20 μPa is the smallest amount of pressure capable of producing the sensation of hearing in a human.

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A sound level of zero "0" dB is scaled such that it is defined as the threshold of human hearing, and would be barely audible to a human of normal hearing under extremely quiet listening conditions. Such conditions can only be generated in anechoic or "dead rooms". Typically, the quietest environmental conditions (extreme rural areas with extensive shielding) yield sound levels of approximately 20 decibels. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB roughly correspond to the threshold of pain.

The minimum change in sound level that the human ear can detect is approximately 3.0 dBA.[2] A change in sound level of 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness.[3] A change in sound level of 10 dB actually represents an approximate 90 percent change in the sound intensity, but only about a 50 percent change in the perceived loudness. This is due to the nonlinear response of the human ear to sound.

As mentioned above, most of the sounds we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate the sound we hear. The method commonly used to quantify environmental sounds, consists of determining all of the frequencies of a sound according to a weighting system that reflects the nonlinear response characteristics of the human ear. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (or dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.[4]

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of sounds from distant sources that create a relatively steady background noise in which no particular source is identifiable. For this type of noise, a single descriptor called the L_{eq} (or equivalent sound level) is

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[2] Every 3 dB equates to a 50% of drop (or increase) in wave strength; therefore a 6 dB drop/increase = a loss/increase of 75% of total signal strength and so on.

[3] This is a subjective reference based upon the nonlinear nature of the human ear.

[4] In some cases, it is important to measure the distribution of sound pressure as a function of frequency. Under these circumstances, the incoming sound wave is passed through a series of band pass filters having predefined frequencies where they are resonant. The relative response of each filter (in dB, dBA, etc.) directly corresponds to the amount of sound energy present at that particular frequency. In standard acoustics two unique filter sets are used to accomplish this task, namely the 1/1 octave band and 1/3 octave band set. An octave is defined as the interval between any two frequencies having a ratio of 2 to 1.

By definition, a whole octave filter (1/1) is a band-pass filter having a bandwidth equal to 70.7-percent of its center frequency (i.e., the frequency of interest) distributed across 11 bands between 11 Hz and 22,700 Hz (the effective audio frequency range). A 1/3 Octave Band filter has a bandwidth equal to 23.1% of its center frequency, distributed across 32 bands between 14.1 Hz and 22,390 Hz. Thus, the octave band frequencies would be 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hz. The corresponding 1/3 octave band frequencies would be 16, 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10000, 12500, 16000 and 20000 Hz.

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used. L_{eq} is the energy-mean A-weighted sound level during a measured time interval, and would be defined mathematically by the following continuous integral,

$$L_{eq} = 10 Log_{10}\left[\frac{1}{T}\int_{0}^{T} SPL(t)^2\, dt\right]$$

where,

L_{eq} is the energy equivalent sound level,
t is the independent variable of time,
T is the total time interval of the event,
and, SPL is the sound pressure level *re. 20 μPa*.

Thus, L_{eq} is the 'equivalent' constant sound level that would have to be produced by a given source to equal the average of the fluctuating level measured. For most acoustical studies, the study interval is generally taken as one-hour and is abbreviated $L_{eq\text{-}h}$ or $L_{eq(h)}$; however, other time intervals are utilized depending on the jurisdictional preference.

For a series of discrete sound sources, the above expression would reduce to its Riemann equivalent to,

$$L_{eq} = 10 Log_{10}\left[\frac{1}{T}\sum_{i=1}^{n} SPL(t_i)^2 \Delta t_i\right]$$

To describe the time-varying character of environmental noise, the statistical noise descriptors L_{10}, L_{50}, and L_{90} are commonly used. They are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of a stated time.

Sound levels associated with the L_{10} typically describe transient or short-term events, while levels associated with the L_{90} describe the steady state (or most prevalent) noise conditions. The L_{50} level is the arithmetic average of the measured sound interval. In addition, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum and minimum measured sound level (L_{max} and L_{min}) indicators. The L_{min} value obtained for a particular monitoring location is often called the *acoustic floor* for that location.

Finally, the aggregate of all community noise events are typically averaged into a single value known as the Community Noise Equivalent Level (CNEL). This descriptor is calculated by averaging all events over a specified time interval and applying a 5-dBA penalty to any sounds occurring between 7:00 p.m. and 10:00 p.m., and a 10-dBA penalty to sounds that occur during nighttime hours (i.e., 10 p.m. to 7 a.m.). This penalty is applied to compensate for the increased sensitivity to noise during the quieter nighttime hours.

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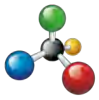
Mathematically, CNEL can be derived based upon the hourly L_{eq} values, via the following expression:

$$CNEL = 10Log_{10}\frac{1}{n}\sum_{i=1}^{n}\left(10^{\frac{Leq(day)_i}{10}} + 10^{\frac{Leq(evening+5)_i}{10}} + 10^{\frac{Leq(night+10)_i}{10}}\right)$$

where,

$L_{eq}(x)_i$ is the equivalent sound level during period '*x*' at time interval 'i' and 'n' is the number of time intervals.



ENVIRONMENTAL SIGNIFICANCE THRESHOLDS

California Environmental Quality Act (CEQA) Thresholds

Section 15382 of the California Environmental Quality Act (CEQA) guidelines defines a significant impact as,

> *"… a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance."*

The minimum change in sound level that the human ear can detect is approximately 3-dBA. This increment, 3-dBA, is commonly accepted under CEQA as representing the point where a noise level increase would represent a significant impact. This impact threshold is accepted by the County of Imperial, and will be used as the significance threshold to determine a project's impact on the affected (existing) environment.

County of Imperial Construction Noise Standards

Construction noise levels in the County of Imperial are governed under the Noise Element of the County's General Plan. Construction equipment operation shall be limited to the hours of 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 5 p.m. Saturday. No commercial construction operations are permitted on Sunday or holidays.

Construction noise, from a single piece of equipment or a combination of equipment, shall not exceed 75 dBA L_{eq} when averaged over an eight (8) hour period (i.e., 75 dBA $L_{eq(8h)}$), and measured at the nearest sensitive receptor. This standard assumes a construction period relative to an individual sensitive receptor of days or weeks. In cases of extended length construction times, the standard may be tightened so as not to exceed 75 dB Leq when averaged over a one (1) hour period (i.e., 75 dBA $L_{eq(1h)}$).

Thus for the purposes of analysis within this report, the applicable standard will be 75 dBA $L_{eq(1h)}$ as measured at the nearest sensitive receptor since construction is expected to occur for an extended period of time.

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ANALYTICAL APPROACH AND METHODOLOGY

Existing Conditions Survey

Two noise-monitoring locations were selected at the project site for the purpose of determining the ambient baseline site conditions. The instrumentation locations, denoted as Monitoring Locations ML 1 and ML 2 are shown in Figures 4a through -c, starting on the following page. Measurements at both locations were taken on July 30, 2010, between 11:00 a.m. and 12:30 p.m., with normal traffic flow conditions in the vicinity of the project site.

For the field monitoring effort, two Quest SoundPro SP-DL-2 ANSI Type 2 integrating sound level meters were used for data collection. Each meter was affixed to a tripod five-feet above ground level, in order to simulate the noise exposure of an average-height human being. Prior to testing, all equipment was calibrated at ISE's acoustics and vibration laboratory to verify conformance with ANSI S1-4 1983 Type 2 and IEC 651 Type 2 standards.[5]

Construction Noise Impact Assessment Approach

Construction noise emission generators would consist primarily of activities associated with site clearing and grading, underground work, and PV / Tower construction activities. Anticipated construction noise present at the project site was based upon measured levels from each diesel equipment category type and the duty cycle of each of the equipment components over a given workday.[6] Cumulative (i.e., worst case aggregate) levels were calculated for a range of expected noise emissions and propagated to the closest sensitive receptors for the purposes of qualitative impact analysis.

[5] All testing and calibration is performed by ISE's Acoustics and Vibration Laboratory using a LORAN-C frequency and time standard traceable to National Institute of Standards & Technology (NIST). The LORAN-C network provides redundant time and frequency calibration signals from 50 cesium atomic clock transmitters within the northern hemisphere with a long-term stability of 10^{-12}. Specifications for traceability can be obtained at *www.nist.gov*.

[6] Source: EPA PB 206717, Environmental Protection Agency, Dec. 31, 1971, *"Noise from Construction Equipment & Operations"*.

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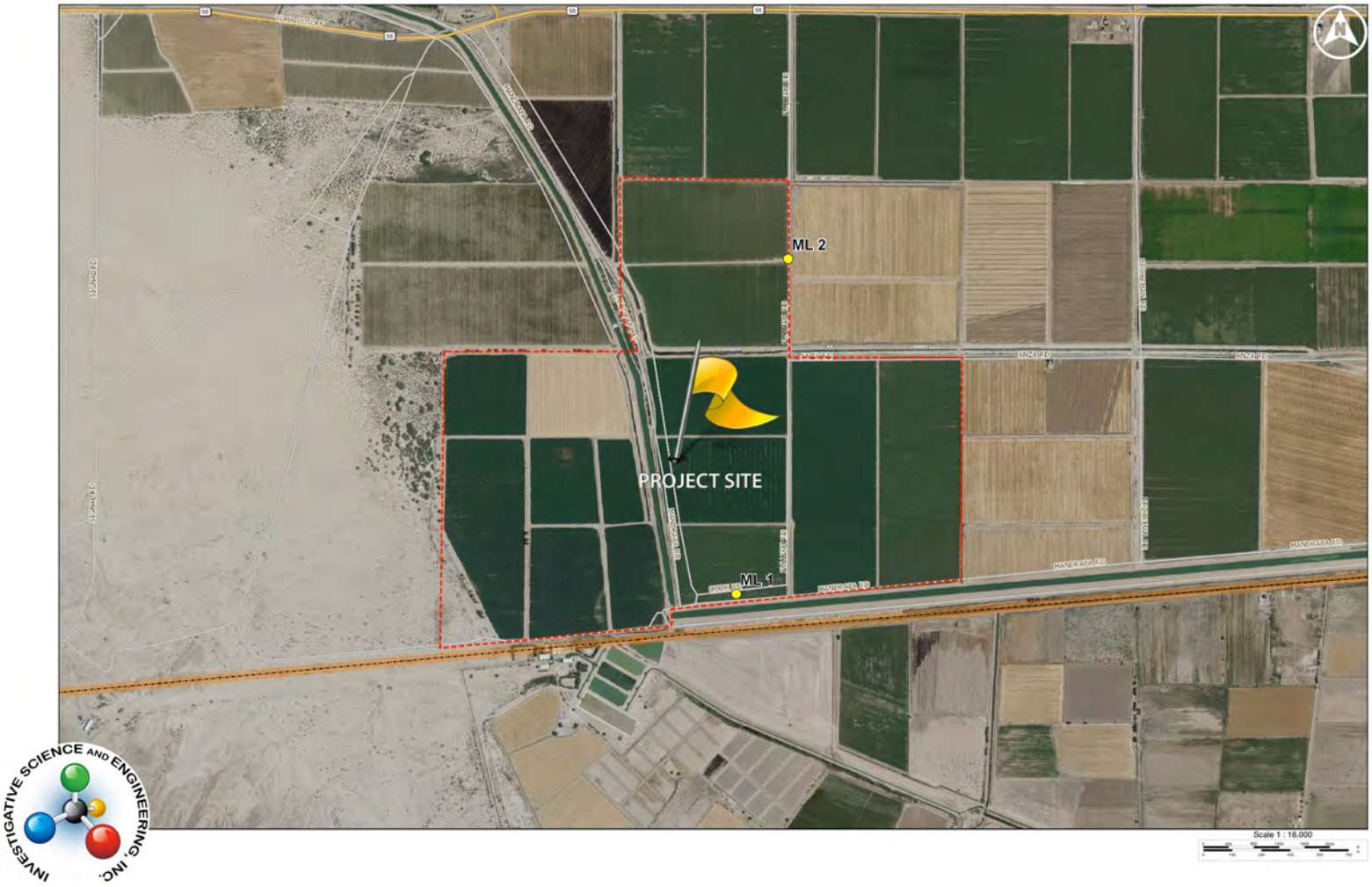

FIGURE 4a: Ambient Noise Monitoring Locations ML 1 and ML 2

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FIGURES 4b and -c: Ambient Monitoring Location ML 1 and ML 2 (ISE 7/10)

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Traffic Segment Impact Assessment Approach

The ISE *RoadNoise v2.4* traffic noise prediction model, which is based upon the Federal Highway Administration's RD-77-108 Noise Prediction Model with California (CALVENO, FHWA/CA/TL-87/03) noise emission factors, was used to calculate the increase in vehicular traffic noise levels, due to construction of the proposed Imperial Solar Energy Center South project, along all identified major servicing roadways.[7] The model assumed a 'soft-site' propagation rule and a 95/3/2 mix of automobiles/midsize vehicles/trucks, thereby yielding a representative worst-case noise contour set.[8]

FINDINGS AND RECOMMENDATIONS

Ambient Sound Measurement Results

Testing during the monitoring period was performed under daytime conditions, with a variable, light breeze of approximately 1 to 3 miles per hour at the project site. The results of the sound level monitoring are shown in Table 1 below with log files from each monitoring station provided as attachments to this report. The values for the predicted equivalent sound level (L_{eq-h}), the maximum and minimum measured sound levels (L_{max} and L_{min}), and the statistical indicators L_{10}, L_{50}, and L_{90}, are given for each of the monitoring locations.

TABLE 1: Measured Ambient Sound Levels – Imperial Solar Energy Center South

		1-Hour Noise Level Descriptors in dBA					
Monitoring Location	**Start Time**	**L_{eq}**	**L_{max}**	**L_{min}**	**L_{10}**	**L_{50}**	**L_{90}**
ML 1	11:00 p.m.	44.2	75.8	36.3	43.6	40.2	38.7
ML 2	11:30 p.m.	43.3	66.8	30.7	42.8	36.2	34.3

Monitoring Locations:

Location 1: Along Cook Road frontage approximately 100-feet from roadway centerline.
GPS: N32 39.246 x W115 39.540, EPE 12 ft, Temp 104.0°F, RH 48%

Location 2: Along Pulliam Road approximately 50-feet from centerline location.
GPS: N32 40.114 x W115 39.380, EPE 12 ft, Temp 104.4°F, RH 49%

Measurements performed by ISE on 7/30/10. EPE = Estimated Position Error.

[7] Source: *Imperial Solar Energy Center South – Draft Traffic Impact Analysis, LOS Engineering, Inc., 8/2/10.*

[8] *Soft-Site* propagation is defined as a 4.5-dBA loss per doubling of distance (DD) between source and receiver.

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The measurements collected reflect ambient sound levels representative of the extremely rural agricultural setting previously shown in Figure 4a. The dominant noise source at ML 1 was clearly from the infrequent movement of U.S. Border Patrol units while at ML 2 noise dominance was entirely from background community and far-field noise. No unusual noise sources or levels were indicated during the testing.

Construction Noise Emission Levels

The estimated construction equipment noise emissions are provided in Table 2 on the following page for the anticipated major construction grading operations expected at the project site. Construction within the proposed project area would typically occur between the hours of 8:00 a.m. and 5:00 p.m. in accordance with County operational requirements. The nearest sensitive residential receptor area would be, at a minimum, well over 5,000-feet from any construction activity centroid.

The resulting average daily construction noise level would vary between 43 to 48 dBA $L_{eq\text{-}h}$ or less at any sensitive receptor area and would not be deemed impactive or disturbing to potential adjacent sensitive receptors per the requirements established by the County of Imperial.

Future Traffic Noise Impacts

The results showing the effect of traffic noise increases on the various servicing roadway segments associated with the proposed Imperial Solar Energy Center South site under the, 1) existing traffic conditions, 2) near-term 2012 cumulative conditions, and, 3) near-term 2012 cumulative + project conditions are presented in Tables 3a through –c starting Page 16 of this report. A summary of the findings and potential impact areas is shown in Table 3d on Page 19.

For each roadway segment examined, the worst case average daily traffic volume (ADT) and observed/predicted speeds are shown, along with the corresponding reference noise level at 50-feet (in dBA). Additionally, the line-of-sight distance from the roadway centerline to the 60 through 75 dBA CNEL contours are provided as an indication of the worst-case unobstructed theoretical traffic noise contour placement.

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TABLE 2: Predicted Construction Noise Levels – Imperial Solar Energy Center South

Construction Phase	Equipment Type	Qty. Used	Duty Cycle (Hrs. / day)	Source Level @ 50 Feet (dBA)	Cumulative Effect @ 50 Feet (dBA Leq_{1h})
Remedial Grading / Clearing / Hauling					
	Dozer - D8 Cat	1	8	75	84.0
	Loader	1	8	70	79.0
	Water Truck	2	4	65	74.0
	Dump/Haul Trucks	4	4	70	82.0
	Scraper	1	4	75	81.0
				Worst-Case Aggregate Sum @ 50 Ft. (Σ):	**88.1**
			Sum @ Closest Receptor Area >5,000-Feet Distant (Σ):		**48.1**
Underground Utility / Transmission Line Construction					
	Track Backhoe	1	6	70	77.8
	Loader/Drill	1	6	70	77.8
	Water Truck	2	4	65	74.0
	Concrete Truck	8	0.5	70	76.0
	Dump/Haul Trucks	2	4	70	79.0
				Worst-Case Aggregate Sum @ 50 Ft. (Σ):	**84.2**
			Sum @ Closest Receptor Area >5,000-Feet Distant (Σ):		**44.2**
PV System Installation / Tower Placement Activities					
	Skid Steer Cat	1	6	70	77.8
	Hydraulic Crane	2	4	70	79.0
	Dump/Haul Trucks	4	0.5	70	73.0
	Paver	1	8	65	74.0
	Roller	1	8	65	74.0
				Worst-Case Aggregate Sum @ 50 Ft. (Σ):	**83.2**
			Sum @ Closest Receptor Area >5,000-Feet Distant (Σ):		**43.2**

Source: EPA PB 206717, Environmental Protection Agency, 12/31/71, "Noise from Construction Equipment and Operations"

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TABLE 3a: 2010 Existing Traffic Noise Conditions

					CNEL Contour Distances (feet)			
Roadway	**Segment**	**ADT**	**Speed (MPH)**	**SPL**	**75 CNEL**	**70 CNEL**	**65 CNEL**	**60 CNEL**
Drew Road	I-8 to SR-98	692	45	57.8	4	8	17	36
Brockman Road	McCabe Rd to SR-98	272	45	53.7	2	4	9	19
	SR-98 to Anza Rd	84	45	48.6	1	2	4	9
Forrester Road	I-8 to McCabe Rd	1,320	45	60.6	5	12	25	55
McCabe Road	Brockman Rd to Forrester Rd	897	45 45	58.9	4	9	20	42
Pulliam Road	SR-98 to Anza Rd	105	45	49.6	1	2	5	10
SR-98	Drew Rd to Pulliam Rd	1,823	45	62.0	7	15	32	68
	Pulliam Rd to Brockman Rd	1,823	45	62.0	7	15	32	68
	Brockman Rd to Clark Rd	1,852	45	62.1	7	15	32	69

Notes:
- ADT = Average Daily Trips. Source: LOS Engineering, Inc., 8/2/10.
- SPL = Sound Pressure Level in dBA at 50-feet from the road edge. CNEL = Community Noise Equivalent Level. All values given in dBA CNEL. Contours assumed to be line-of-sight perpendicular (⊥) distance.

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TABLE 3b: 2012 Cumulative Traffic Noise Conditions

					CNEL Contour Distances (feet)			
Roadway	**Segment**	**ADT**	**Speed (MPH)**	**SPL**	**75 CNEL**	**70 CNEL**	**65 CNEL**	**60 CNEL**
Drew Road	I-8 to SR-98	1,559	45	61.3	6	13	28	61
Brockman Road	McCabe Rd to SR-98	437	45	55.8	3	6	12	26
	SR-98 to Anza Rd	89	45	48.9	1	2	4	9
Forrester Road	I-8 to McCabe Rd	2,503	45	63.4	8	18	39	84
McCabe Road	Brockman Rd to Forrester Rd	952	45	59.2	4	10	21	44
Pulliam Road	SR-98 to Anza Rd	111	45	49.9	1	2	5	11
SR-98	Drew Rd to Pulliam Rd	3,644	45	65.0	11	23	50	108
	Pulliam Rd to Brockman Rd	3,644	45	65.0	11	23	50	108
	Brockman Rd to Clark Rd	3,675	45	65.1	11	24	51	109

Notes:
- ADT = Average Daily Trips. Source: LOS Engineering, Inc., 8/2/10.
- SPL = Sound Pressure Level in dBA at 50-feet from the road edge. CNEL = Community Noise Equivalent Level. All values given in dBA CNEL. Contours assumed to be line-of-sight perpendicular (⊥) distance.

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TABLE 3c: 2012 Cumulative + Project Traffic Noise Conditions

					CNEL Contour Distances (feet)			
Roadway	**Segment**	**ADT**	**Speed (MPH)**	**SPL**	**75 CNEL**	**70 CNEL**	**65 CNEL**	**60 CNEL**
Drew Road	I-8 to SR-98	1,661	45	61.6	6	14	30	64
Brockman Road	McCabe Rd to SR-98	777	45	58.3	4	8	18	39
	SR-98 to Anza Rd	123	45	50.3	1	2	5	11
Forrester Road	I-8 to McCabe Rd	2,809	45	63.9	9	20	42	91
McCabe Road	Brockman Rd to Forrester Rd	1,292	45	60.5	5	12	25	54
Pulliam Road	SR-98 to Anza Rd	757	45	58.2	4	8	18	38
SR-98	Drew Rd to Pulliam Rd	3,814	45	65.2	11	24	52	111
	Pulliam Rd to Brockman Rd	4,120	45	65.6	12	25	55	118
	Brockman Rd to Clark Rd	3,845	45	65.3	11	24	52	113

Notes:
- ADT = Average Daily Trips. Source: LOS Engineering, Inc., 8/2/10.
- SPL = Sound Pressure Level in dBA at 50-feet from the road edge. CNEL = Community Noise Equivalent Level. All values given in dBA CNEL. Contours assumed to be line-of-sight perpendicular (⊥) distance.

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TABLE 3d: Project-Related Traffic Noise Increases

Roadway	Segment	TRAFFIC INCREASES UNDER... Existing Conditions	2012 Near-Term Conditions	Potential Project Impacts?
Drew Road	I-8 to SR-98	n/a	0.3	No
Brockman Road	McCabe Rd to SR-98	n/a	2.5	No
	SR-98 to Anza Rd	n/a	1.4	No
Forrester Road	I-8 to McCabe Rd	n/a	0.5	No
McCabe Road	Brockman Rd to Forrester Rd	n/a	1.3	No
Pulliam Road	SR-98 to Anza Rd	n/a	8.3	Yes
SR-98	Drew Rd to Pulliam Rd	n/a	0.2	No
	Pulliam Rd to Brockman Rd	n/a	0.6	No
	Brockman Rd to Clark Rd	n/a	0.2	No

As can be seen from the findings, an exceedance of 5.3 dBA above the 3.0 dBA CEQA screening threshold (8.3 dBA CNEL total) is indicated on Pulliam Road between State Route 98 (SR 98) and Anza Road. This segment of roadway is shown in Figure 5 on the following page.

There are no sensitive receptors along this roadway segment that would be adversely impacted by construction traffic noise due to the proposed project action. Therefore, no traffic noise mitigation would be required.

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FIGURE 5: Area of Traffic Noise Segment Impact

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CERTIFICATION OF ACCURACY AND QUALIFICATIONS

This report was prepared by Investigative Science and Engineering, Inc. (ISE), located at 1134 D Street, Ramona, CA 92065. The members of its professional staff contributing to the report are listed below:

Rick Tavares *(rtavares@ise.us)*	Ph.D. Civil Engineering M.S. Structural Engineering M.S. Mechanical Engineering B.S. Aerospace Engineering / Engineering Mechanics
Karen Tavares *(ktavares@ise.us)*	B.S. Electrical Engineering

ISE affirms to the best of its knowledge and belief that the statements and information contained herein are in all respects true and correct as of the date of this report. Should the reader have any questions regarding the findings and conclusions presented in this report, please do not hesitate to contact ISE at (760) 787-0016.

Content and information contained within this report is intended only for the subject project and is protected under 17 U.S.C. §§ 101 through 810. Original reports contain a non-photo blue ISE watermark at the bottom of each page.

Approved as to Form and Content:

Rick Tavares, Ph.D.

Project Principal
Investigative Science and Engineering, Inc. (ISE)

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APPENDICES / SUPPLEMENTAL INFORMATION

SLM FIELD DATA SESSION / STUDY REPORTS – ML 1 AND ML 2

Session Report - ML 1

8/6/2010

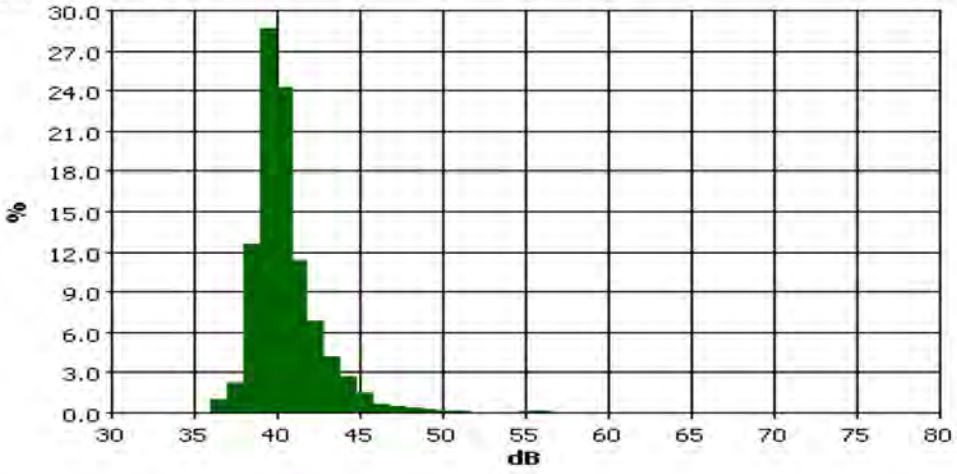
Information Panel

Name	S001
Start Time	Friday, July 30, 2010 10:58:26
Stop Time	Friday, July 30, 2010 12:03:30
Device Model Type	SoundPro DL
Comments	

General Data Panel

Description	Meter/Sensor	Value	Description	Meter/Sensor	Value
Leq	1	44.1 dB	Exchange Rate	1	3 dB
Weighting	1	A	Response	1	SLOW
Bandwidth	1	OFF	Exchange Rate	2	3 dB
Weighting	2	C	Response	2	FAST

Statistics Chart



Statistics Table

dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3	1.1
37.0	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5	2.3
38.0	0.6	0.8	0.9	1.0	1.3	1.5	1.5	1.6	1.6	1.9	12.7
39.0	2.0	2.4	2.7	2.8	2.9	2.8	2.9	3.1	3.5	3.7	28.8
40.0	3.8	2.2	3.1	2.8	2.4	2.2	2.1	2.1	1.9	1.7	24.3
41.0	1.6	1.5	1.3	1.2	1.1	1.0	0.9	0.9	0.9	0.9	11.4
42.0	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	7.0
43.0	0.6	0.2	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.3	4.3
44.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	2.8
45.0	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	1.6
46.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.8
47.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.7
48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.4
49.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
51.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
52.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
53.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
56.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
57.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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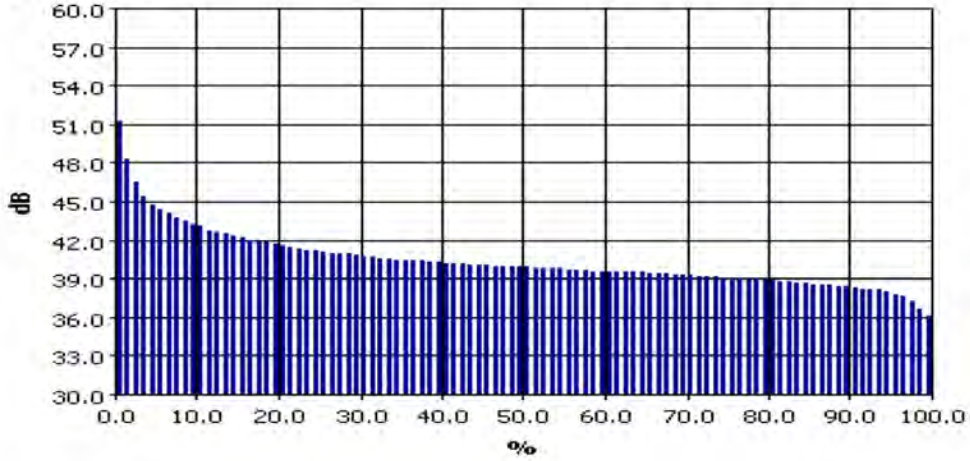
Statistics Table (cont'd)

dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
58.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Exceedance Chart



Exceedance Table

	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
0%		51.3	48.4	46.6	45.5	44.9	44.5	44.2	43.9	43.6
10%	43.4	43.2	42.9	42.7	42.6	42.4	42.3	42.1	42.0	41.9
20%	41.8	41.7	41.6	41.4	41.3	41.3	41.2	41.1	41.0	41.0
30%	40.9	40.8	40.8	40.7	40.7	40.6	40.6	40.5	40.5	40.4
40%	40.4	40.3	40.3	40.3	40.2	40.2	40.2	40.1	40.1	40.1
50%	40.0	40.0	39.9	39.9	39.9	39.9	39.8	39.8	39.8	39.7
60%	39.7	39.7	39.7	39.6	39.6	39.6	39.5	39.5	39.5	39.4
70%	39.4	39.4	39.3	39.3	39.3	39.2	39.2	39.1	39.1	39.1
80%	39.0	39.0	38.9	38.9	38.8	38.8	38.7	38.7	38.6	38.5
90%	38.5	38.4	38.3	38.3	38.2	38.1	37.9	37.8	37.4	36.8
100%	36.2									

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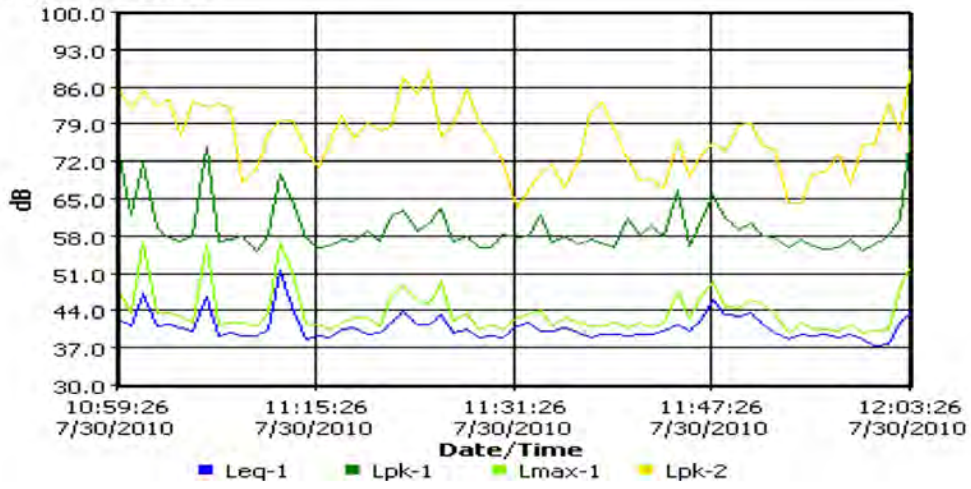
ML 1
Information Panel

Name	ML 1
Location	
Comments	
Start Time	Friday, July 30, 2010 10:58:26
Stop Time	Friday, July 30, 2010 12:03:30
User Name	

General Data Panel

Description	Meter/Sensor	Value	Description	Meter/Sensor	Value
Dose	1	0 %	Lpk	1	94.3 dB
Lmax	1	75.8 dB	Weighting	1	A
Response	1	SLOW	Bandwidth	1	OFF
Exchange Rate	1	3 dB	Int Threshold	1	80 dB
Log Rate	1	60 s	Exchange Rate	2	3 dB
Int Threshold	2	80 dB	Weighting	2	C
Response	2	FAST			

Logged Data Chart



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Study Report
8/6/2010

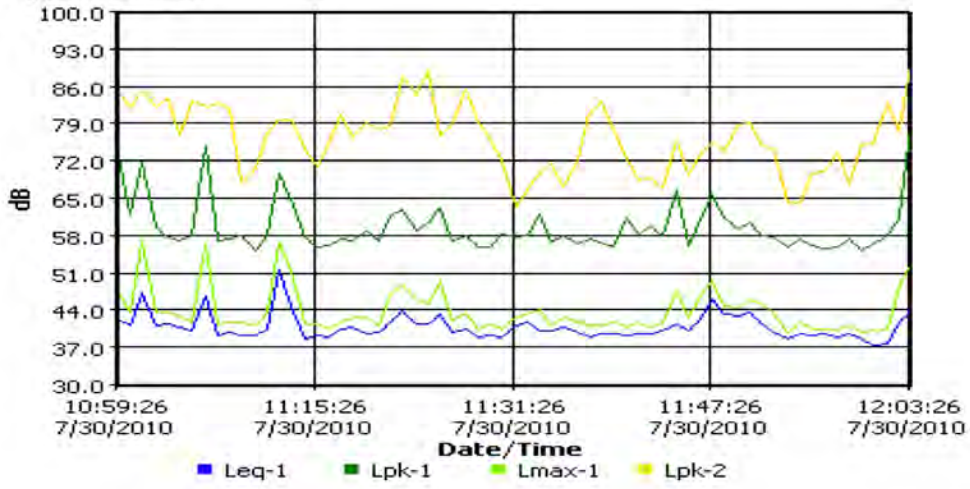
ML 1
Information Panel

Name	ML 1
Location	
Comments	
Start Time	Friday, July 30, 2010 10:58:26
Stop Time	Friday, July 30, 2010 12:03:30
User Name	

General Data Panel

Description	Meter/Sensor	Value	Description	Meter/Sensor	Value
Dose	1	0 %	Lpk	1	94.3 dB
Lmax	1	75.8 dB	Weighting	1	A
Response	1	SLOW	Bandwidth	1	OFF
Exchange Rate	1	3 dB	Int Threshold	1	80 dB
Log Rate	1	60 s	Exchange Rate	2	3 dB
Int Threshold	2	80 dB	Weighting	2	C
Response	2	FAST			

Logged Data Chart



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Session Report - ML 2

8/6/2010

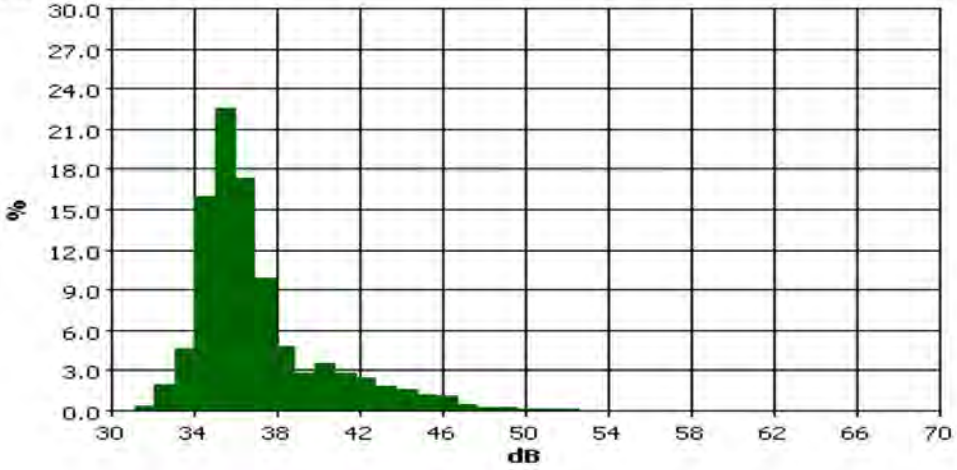
Information Panel

Name	S004
Start Time	Friday, July 30, 2010 11:45:50
Stop Time	Friday, July 30, 2010 12:05:57
Device Model Type	SoundPro DL
Comments	

General Data Panel

Description	Meter/Sensor	Value	Description	Meter/Sensor	Value
Leq	1	43.3 dB	Exchange Rate	1	3 dB
Weighting	1	A	Response	1	SLOW
Bandwidth	1	OFF	Exchange Rate	2	3 dB
Weighting	2	C	Response	2	FAST

Statistics Chart



Statistics Table

dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.5
32.0	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	2.1
33.0	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.7	0.7	4.8
34.0	0.9	1.0	1.1	1.3	1.5	1.8	2.0	2.1	2.1	2.3	16.1
35.0	2.5	2.4	2.0	2.5	2.3	2.5	2.3	2.2	2.1	2.0	22.7
36.0	2.2	2.0	1.9	1.9	1.7	1.7	1.6	1.6	1.5	1.3	17.4
37.0	1.2	1.1	1.1	1.1	1.1	1.0	0.9	0.9	0.9	0.8	10.0
38.0	0.7	0.6	0.5	0.6	0.5	0.5	0.4	0.4	0.3	0.4	4.9
39.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.9
40.0	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	3.7
41.0	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	3.0
42.0	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.2	2.5
43.0	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	2.0
44.0	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	1.8
45.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.4
46.0	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.2
47.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.6
48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
49.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4
50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
51.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
52.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
53.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
56.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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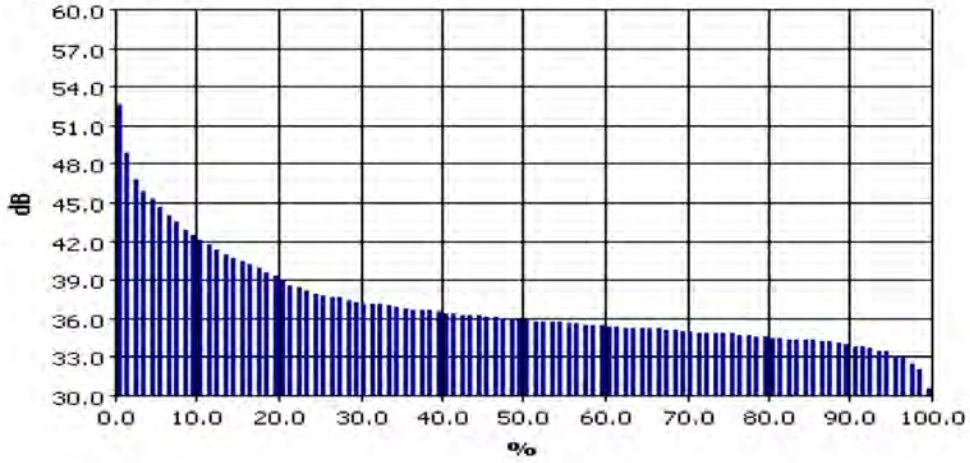
Statistics Table (cont'd)

dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
58.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
65.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Exceedance Chart



Exceedance Table

	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
0%		52.7	49.0	46.9	46.0	45.4	44.7	44.1	43.6	43.0
10%	42.6	42.2	41.8	41.4	41.1	40.8	40.6	40.3	40.0	39.7
20%	39.4	39.0	38.7	38.5	38.2	38.0	37.9	37.8	37.7	37.5
30%	37.4	37.3	37.2	37.2	37.1	37.0	36.9	36.8	36.7	36.7
40%	36.6	36.5	36.5	36.4	36.3	36.3	36.2	36.2	36.1	36.1
50%	36.0	36.0	35.9	35.9	35.8	35.8	35.7	35.7	35.6	35.6
60%	35.6	35.5	35.5	35.4	35.4	35.3	35.3	35.3	35.2	35.2
70%	35.1	35.1	35.0	35.0	34.9	34.9	34.9	34.8	34.8	34.7
80%	34.7	34.6	34.6	34.5	34.5	34.4	34.4	34.3	34.3	34.2
90%	34.1	34.0	33.9	33.8	33.6	33.5	33.2	33.0	32.6	32.2
100%	30.6									

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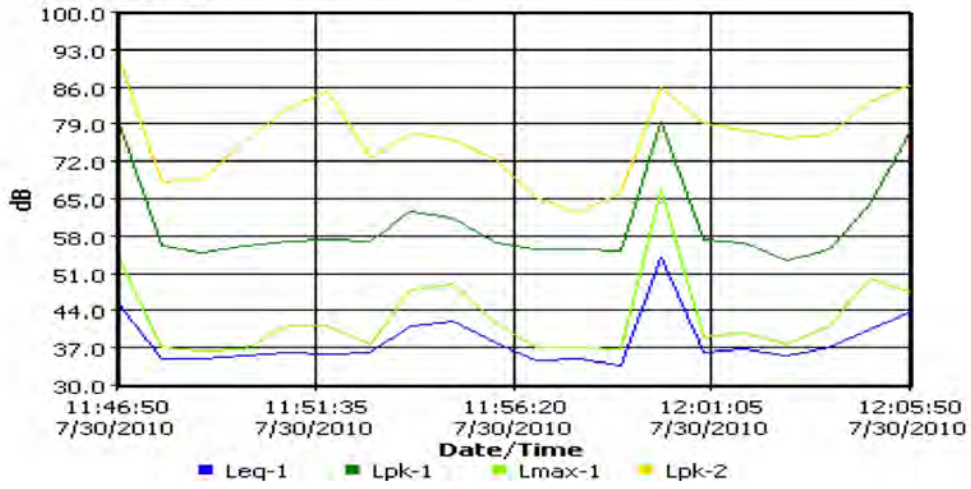
ML 2
Information Panel

Name	ML 2
Location	
Comments	
Start Time	Friday, July 30, 2010 11:45:50
Stop Time	Friday, July 30, 2010 12:05:57
User Name	

General Data Panel

Description	Meter/Sensor	Value	Description	Meter/Sensor	Value
Dose	1	0 %	Lpk	1	79.5 dB
Lmax	1	66.8 dB	Weighting	1	A
Response	1	SLOW	Bandwidth	1	OFF
Exchange Rate	1	3 dB	Int Threshold	1	80 dB
Log Rate	1	60 s	Exchange Rate	2	3 dB
Int Threshold	2	80 dB	Weighting	2	C
Response	2	FAST			

Logged Data Chart



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Study Report
8/6/2010

ML 2
Information Panel

Name	ML 2
Location	
Comments	
Start Time	Friday, July 30, 2010 11:45:50
Stop Time	Friday, July 30, 2010 12:05:57
User Name	

General Data Panel

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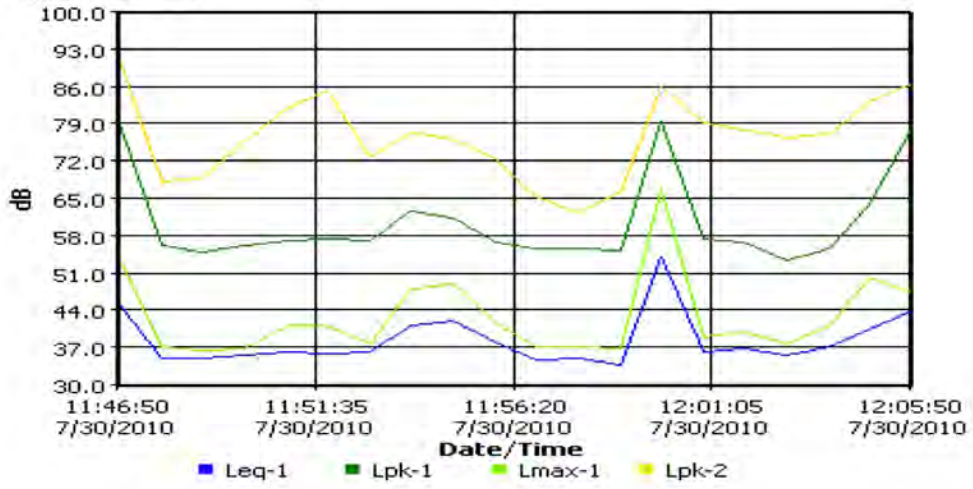
Logged Data Chart



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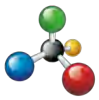

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